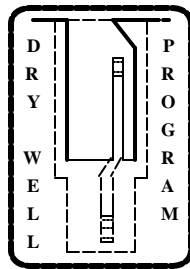




DRYWELL INVESTIGATION GUIDELINES



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Arizona Department of Environmental Quality

Water Quality Division

DRYWELL INVESTIGATION GUIDELINES

OBJECTIVE

This document provides guidance for the investigation of a drywell that may have received fluids other than storm water. The Aquifer Protection Program requirements, where applicable, are discussed in the document. This guidance should help drywell owners determine whether further investigation of soil outside a drywell is necessary. If the sampling results from the drywell settling chamber sediments exceed the residential soil remediation levels or groundwater protection levels, whichever is less, a soil boring drilled outside the drywell is necessary to determine the extent of contamination and the necessity for remediation. This document also provides guidance for collecting samples from a soil boring outside a drywell and for selecting appropriate analytical methods. Soil investigations should be completed in accordance with the Department's Remedial Action Rule [Arizona Administrative Code (A.A.C.) Title 18, Chapter 7] and the requirements of the Aquifer Protection Program.

INTRODUCTION

According to Arizona Revised Statutes (A.R.S.) § 49-241.B.5, facilities that add a pollutant to a drywell shall obtain an individual Aquifer Protection Permit (APP). Pursuant to A.A.C. R18-9-102.A., drywells that are used solely to receive storm water runoff are exempt from obtaining an APP **except those that drain areas in which hazardous substances are used, stored, loaded or treated.** Thus, an investigation is necessary and an APP is required for drywells draining areas where any hazardous substances (including wastes, products, fuels, etc.) are used, stored, loaded, or treated.

Note: Currently rulemaking is in process to allow certain drywells to operate under the provisions of a general permit. These changes to the aquifer protection program rules are currently scheduled to be in place by January 2001. Please contact ADEQ at (602) 207-4696 or (800) 234-5677 (Ext. 4696) for more information on the status of these rules.

DEFINITIONS

A “**drywell**” is defined as a bored, drilled or driven shaft or hole in which the depth is greater than the width and is designed specifically for the disposal of storm water. Typical drywells are made up of an upper settling chamber and a lower gravel-filled section. An injection pipe may connect the two sections. A schematic of a typical drywell is presented in Figure 1.

“**Constituents of concern**” are the chemicals and constituents of the chemicals known to be used, stored, loaded or treated at the site; chemicals or classes of chemicals that are commonly used, or historically associated with the type of operation or business conducted at the site; and breakdown products or byproducts of chemicals and processes associated with the activities at the site.

SCENARIOS WHERE DRYWELL INVESTIGATIONS ARE RECOMMENDED

The four most common scenarios applicable to a drywell are described as follows. If a drywell at your property does not meet any of the following descriptions, please contact the ADEQ Industrial and Drywell Unit for guidance.

A. **Drywells located on non-industrial/non-commercial property.**

The Aquifer Protection Program requirements do not typically apply to drywells located at these sites. However, if an environmental assessment will be conducted, ADEQ recommends that the facility owner(s)/operator(s) collect a sample of the drywell settling chamber sediment (or sludge) to ensure that the well has not received discharges other than storm water. The sediment sample should be analyzed for total petroleum hydrocarbons (TPH), at a minimum, using an appropriate test method (see section entitled *Sampling and Screening Guidelines*). ADEQ may provide a courtesy review of the sampling data if requested by the drywell owner.

B. **Drywells located on industrial or commercial property where hazardous substances are used, stored, loaded or treated on the facility property but NOT within the surface drainage capture area of the drywell.**

Drywell Investigation Screening

The Aquifer Protection Program requirements do not apply to drywells located at these sites unless there is evidence that the on-site operations have added a pollutant to a drywell. If there is a concern that a drywell is now, or has been, impacted by pollutants because of on-site activities, at least one sediment sample from the settling chamber should be collected to determine if the drywell has received discharges other than stormwater. Analyte selection should be based on the substances used, stored, loaded or treated on site and should include all applicable constituents of concern. The facility's material safety data sheets (MSDSs), if available, should be reviewed to determine an applicable list of constituents. If information about chemicals used or waste generated at the site is not available, at a minimum, the analyses should include TPH, volatile organic compounds (VOCs), and total metals (see *Sampling and Screening Guidelines*). **Samples are considered valid only if collected prior to cleanup of the chamber.**

If the contaminant concentrations detected in the settling chamber sediments reflect background levels or derive from typical storm water discharges, no further investigation will be necessary. Otherwise, further investigation may be required to determine the nature and extent of contamination as described in Part C below.

Best Management Practices

In general, facility owners/operators of these sites are required to develop and employ a Best Management Practices Plan (BMPP) to ensure that unauthorized discharges to drywell will not

occur. The BMPP should conform to the ADEQ BMPP guidelines and should describe the methods, practices and employee training used to prevent unauthorized discharges, including structural and non-structural controls, and operation and maintenance procedures. ADEQ may waive the BMPP requirement if adequate justification is provided in writing.

C. Drywells located on industrial or commercial property where hazardous chemicals are used, stored, loaded, or treated within the surface capture area of the drywell.

Operators of these facilities are required to obtain an APP pursuant to A.R.S. § 49-241.B.5 and A.A.C. R18-9-102.A. A drywell investigation will be required and a drywell investigation report must be submitted as part of the APP application. The report should include the following information.

Drywell Investigation Screening

A drywell investigation must be performed to determine that pollutants have not been added to the drywell and that compliance with aquifer water quality standards at the point of compliance is maintained. Sampling recommendations, as described in Part B above, should be followed. A complete description of the sampling activities including sampling methods, equipment and sample handling and preservation should be included in the investigation report.

Best Available Demonstrated Control Technology (BADCT)

In addition to a Best Management Practices Plan (BMPP) as described in Part B, other pre-treatment devices, such as an interceptor, Envibro© system or other equivalent design, may be necessary to satisfy the BADCT requirements.

Site-Specific Groundwater and Flood Plain Information

An inventory of all wells within one-half mile of the facility should be conducted. General depth-to-groundwater and groundwater flow direction information from the Arizona Department of Water Resources or USGS maps is acceptable only if appropriately constructed groundwater wells do not exist within one-half mile of the facility. Information indicating the location of the facility with respect to a flood plain should be submitted.

Drywell Information

A copy of the drywell drilling log that documents the surface and subsurface lithology should be submitted, if available. Any available information on the design, construction, maintenance and history of the drywell should be provided. At a minimum, information on the diameter, total depth and construction date of the drywell is necessary.

Upon submittal of all the above information, ADEQ will determine whether further investigation of the drywell is required. In general, if the contaminant concentrations in the settling chamber sediments reflect background levels or derive from typical storm water discharges, further investigation will not be necessary. If a contaminant concentration detected in the settling chamber sediment exceeds 50% of the residential Soil Remediation Level (SRL) or the Groundwater Protection Level (GPL) for that contaminant, a confirmation sediment sample should be collected

from the drywell settling chamber. If a contaminant concentration detected in either the initial or confirmation settling chamber sample exceeds the SRL or GPL for that contaminant, further subsurface assessment is required to define the degree and extent of contamination. **The decision for additional characterization will also be influenced by the type of contaminants present, disposal history, depth-to-groundwater and known site-specific lithologic conditions.**

Upon completion and approval of the drywell investigation and APP requirements, a permit can be issued for continuing operation of the drywell.

D. Drywell closures at industrial/commercial properties where hazardous substances have been used, stored, loaded or treated.

According to A.R.S. § 49-252, drywells located in these areas may be closed without an APP under a clean closure approval. To demonstrate a clean closure, a drywell investigation must be conducted as described in Part C above, and a clean closure application must be submitted to ADEQ for approval. Drywells are typically decommissioned as part of closure activities, but in some cases, the drywell may remain to receive only uncontaminated stormwater in the future if all hazardous substance handling activities are removed from the drainage area. If ADEQ determines that the closure plan meets the definition of clean closure, a letter of approval will be issued to the owner or operator. If the review of a closure plan indicates that post-closure monitoring or maintenance at the site is necessary, an APP will be required.

If a drywell is to be closed and a permit or clean closure approval from ADEQ is required for closure, the drywell should not be decommissioned until ADEQ has reviewed and approved the results of the drywell investigation.

E. Injection Wells

A drywell is considered an injection well if it is constructed or used for the purpose of injecting fluids containing pollutants (other than storm water) into the subsurface. Limited general permit categories apply to injection wells according to A.A.C. R18-9-129.E. Otherwise, an individual APP is required for continuing operation. Clean closure of these wells may be pursued if the requirements for clean closure are met. **Sampling requirements for injection well investigations may be more comprehensive than for drywell investigations. All injection well investigations should be pre-approved by ADEQ.**

ADDITIONAL DRYWELL INVESTIGATION

A. Soil Boring

If analytical results from a sample of the settling chamber sediments exceed the residential SRLs or GPLs, a soil boring is necessary. The soil boring should be drilled hydraulically downgradient from the drywell at a distance of no more than five feet from the edge of the drywell. If the drywell is undergoing closure, the soil boring may be advanced through the center of the drywell shaft provided all settling chamber sediments are removed prior to drilling and a sample of the native soil beneath the drainage rock can be obtained.

Soil samples should be collected at five foot intervals and at any distinct changes in lithology, starting at the depth of the bottom of the settling chamber and continuing to a total depth of at least 10 feet below the bottom of the drywell injection pipe. The boring should be advanced to deeper levels and sampled if warranted based on professional judgment or clues from visual examination or field screening equipment. (See Figure 1 for drywell sampling)

All collected soil samples should be analyzed for all constituents of concern that were detected in the drywell chamber sediment above background concentrations, even if the detected concentrations were below the SRLs and GPLs. If the constituents of concern include VOCs, the soil samples should be analyzed for VOCs even if no VOCs were detected in the drywell chamber sediment. In some cases, indicator parameters such as TPH may be used to reduce the number of analyses. Decisions should be based on site-specific conditions, and a rationale should be provided. Please contact the ADEQ Industrial and Drywell Unit for assistance in determining the appropriate analyses.

Upon completion of soil sampling, the boring should be properly closed to ensure that contaminant migration will not occur.

B. Site-Specific Conditions

1. During drilling, certain lithologic conditions (such as extremely coarse-grained materials) may result in auger refusal or otherwise prohibit adequate sample recovery for laboratory analysis. Contaminants detectable in settling chamber sludge may be absent in coarse-grained sediments but detectable in fine-grained layers or the underlying groundwater. Professional judgment should be exercised when determining sample locations and defining the extent of contamination.
2. Soil gas sampling is recommended when VOC analysis is required and the cobble and gravel content of the soils results in low or no sample recovery.
3. If groundwater is encountered during drilling, groundwater samples should be collected according to current EPA, ADEQ and ADHS requirements and analyzed for all constituents of concern.

C. Groundwater Investigation

ADEQ may request groundwater sampling if soil sampling is inadequate to determine the extent of impact (e.g., B.1. above), the drywell shaft is completed in or close to the water table, or impact to groundwater is suspected.

DRYWELL REMEDIATION

Upon completion of the drywell investigation, it is recommended that the settling chamber sediments be removed and disposed of according to all applicable federal, state, and local regulations. If an additional

investigation indicated that subsurface soils are contaminated at levels exceeding background soil concentrations, the soil must be remediated to meet the department's soil remediation standards. Further assessment to determine that aquifer water quality standards have not or will not be violated at the point of compliance may be necessary.

If the drywell is to be decommissioned, the abandonment should follow the ADEQ Drywell Decommissioning Guidelines. **If a permit or clean closure approval from ADEQ is required for closure, the drywell should not be abandoned until ADEQ has reviewed and approved the results of the drywell investigation.** If the installation of a new drywell is necessary to replace the decommissioned drywell, the guidance manual for design, installation, operations, maintenance and inspection of drywells should be followed.

SAMPLING AND SCREENING GUIDELINES

Sampling Procedures

A description of the sampling procedures, including sampling equipment and sample handling and preservation, should be submitted. Sampling procedures should be consistent with current EPA, ADEQ and ADHS requirements. Sludge, sediment and soil sampling methods for VOCs should be consistent with EPA Method 5035 requirements according to ADEQ policy.¹ Drywell sediment samples for VOC analysis should be collected as discreet samples from as deep within the settling chamber sediments as possible so that losses due to volatilization will be minimized. All other sediment samples should be composited from several locations within the settling chamber sediments.

Analytical results must include the method of sample analysis and relevant quality assurance/quality control (QA/QC) data. In general, at least one replicate sample and one type of blank must be obtained for every 10 field samples. If there are less than ten field sampling points, one replicate sample and blank must be obtained. Chain-of-custody documentation and proof of laboratory certification should be provided. The laboratory must be certified by ADHS for each specific method used.

Analytical Methods

The most common analyses performed on drywell sediments and soils include TPH, VOCs semi-VOCs, and metals using one or more of the following methods²:

1. 8015AZ (C₁₀-C₃₂ Hydrocarbons). Benzene, toluene, ethyl benzene and xylenes (BTEX) by EPA 8021B and polycyclic aromatic hydrocarbons (PAH) analyses by EPA 8270 or 8310 may be required depending on the type of petroleum products used and the concentration of TPH detected.
2. EPA 8260B or EPA 8021B (VOCs). EPA 8260 should be used when all the potential contaminants at a site have not been identified. EPA 8021B should be used for specific contaminants only, such as BTEX.
3. EPA 8270 (Semi-VOCs). This method should be used where semi-VOCs are suspected. For PAH only, EPA 8310 should be used.

4. EPA 6000 and 7000 series for **total metals**. Arsenic, barium, cadmium, chromium, lead and mercury are common contaminants. Other metals with aquifer water quality standards include antimony, beryllium, nickel, selenium and thallium. Metals such as copper, silver and zinc should be requested if they are possible indicators of an unauthorized discharge.

In the drywell investigation scenarios B, C and D discussed on pages 3-5, additional analyses may be necessary based on the type and amount of chemicals that the facility uses, stores, loads or treats on-site or wastes that are generated.

¹ Includes field preservation in methanol, Encore® samplers or extraction within two hours of collection. The storage of soil samples in glass jars without methanol is no longer acceptable for VOC analysis.

²The analytical method used must be a method approved by the Arizona Department of Health Services. Any approved analytical method for each parameter may be used as long as the substituted method provides detection limits that are adequate to meet regulatory limits.

Drywell Investigation Screening Process

The following tables of minimum GPLs and corresponding residential SRLs are presented to assist drywell owners or operators in determining whether further investigation of the drywell is necessary. If either standard is exceeded in the settling chamber sediments, a soil boring is necessary. For contaminants that are not listed, contact the ADEQ Industrial and Drywell Unit for assistance.

Please note that soil borings may be required for injection well investigations regardless of the concentrations detected in the settling chamber sediments.

Demonstration of Technical Capability

If a soil boring is required, the services of a registered professional engineer or registered geologist may be required to certify that the work was performed according to the recommendations described in this document. All documents submitted to ADEQ which fall within the statutory definition of engineering practice or geologic practice are to be prepared by a qualified preparer and sealed by an appropriate registrant of the Arizona State Board of Technical Registration according to the applicable laws and rules.

Drywell owners or facility operators should contact the ADEQ Water Permits Section Industrial and Drywell Unit at (602) 207-4686 to obtain technical guidance and, if necessary, to ensure that all regulatory concerns are addressed. Additional information about the drywell program can also be obtained through the Drywell Hotline at (800) 207-2261, or by accessing our Web site at [www.adeq.state.us\envIRON\water\permits\drywell.html](http://www.adeq.state.us/envIRON/water/permits/drywell.html).

Table I. Minimum GPLs and Residential SRLs for Organic Contaminants

	Minimum GPL (mg/kg)	Residential SRL (mg/kg)
Total Petroleum Hydrocarbons	None	4,100
Benzene	0.71	0.62
Carbon Tetrachloride	1.6	1.6
<i>o</i> -Dichlorobenzene	72	1,100
<i>p</i> -Dichlorobenzene	9.3	500
1,2-Dichloroethane (1,2-DCA)	0.21	2.5
1,1-Dichloroethylene (1,1-DCE)	0.81	0.36
<i>cis</i> -1,2-Dichloroethylene (<i>cis</i> -1,2-DCE)	4.9	31
<i>trans</i> -1,2-Dichloroethylene (<i>trans</i> -1,2-DCE)	8.4	78
1,2-Dichloropropane	0.28	3.1
Ethylbenzene	120	1500
Monochlorobenzene	22	65
Styrene	36	3300
Tetrachloroethylene (PCE)	1.3	53
Toluene	400	790
Chloroform	6.8	2.5
1,1,1-Trichloroethane (TCA)	1.0	1200
Trichloroethylene (TCE)	0.61	27
Xylenes (Total)	2200	2800
Alachlor	0.11	55
Atrazine	0.11	20
Carbofuran	2.1	330
1,2-Dibromo-3-chloropropane (DBCP)	.015	3.2
Ethylene dibromide (EDB)	.0033	0.049
Endrin	45	20
Lindane	0.088	3.4
2,4-Dichlorophenoxyacetic acid (2,4-D)	6.7	650
Trichlorophenoxypropionic acid {(2,4,5-TP) or Silvex]	42	520

Table II. Minimum GPLs and Residential SRLs for Metals

Metals	Minimum GPL (mg/kg)	Residential SRL (mg/kg)
Antimony	35	31
Arsenic	290	10
Barium	12,000	5300
Beryllium	23	1.4
Cadmium	29	38
Chromium	590	2100
Lead	290	400
Mercury	12	6.7
Selenium	290	380
Nickel	590	1500
Thallium	12	5.4 as Thallic Oxide

References

1. EPA-Region IX, *Guidelines for Closure of Shallow Disposal Wells*, 1992.
2. ADEQ, *Policy 0170.000: Implementation of EPA Method 5035 - Soil Preparation for EPA Methods 8015B, 8021B, and 8260B*, 2000.
2. ADEQ, *Best Management Practices Plan (BMPP) Guidance for Drywells*, August 2000.
3. ADEQ, *Clean Closure Application For Qualifying Discharging Facilities and Drywells*, 1998.
4. ADEQ, *Quality Assurance Project Plan*, 1991.
5. ADEQ, *Drywell Decommissioning Guidelines*, August 2000.